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ABSTRACT

A study examined the type of Wh question (those introduced by who, what, when, where, why, or how) and the phrase structure rules required for the verb phrase to determine how they relate to the acquisition and development of the Wh question transformation. Children ranging in age from 2 to 6 years were given three tasks, each containing 36 stimulus sentences employed to measure competence in three areas of the Wh question transformation: imitation, comprehension, and production. Analysis showed that children's comprehension of who, what, where, and how questions was significantly better than their production of these questions because concrete referents were more readily available for these four types. The means for the various age groups for imitation and production revealed imitation was higher than production or not different from production for all age groups. The figures also suggested that although Wh questions containing the verb phrase present + do + verb were grammatically more complex than those containing the other two verb phrase types, the children did not have less facility with Wh questions containing present + do + verb, and, in fact, performed better with this type than with the other two. On imitation, most of the children were performing the operations of preposing and transposing, but as indicated by some of the responses, some of them did not apply the number agreement rule. The substantially larger number of deviant responses for production than for imitation suggests that children imitate Wh questions before they search for the semantic understanding needed to produce them. (HOD)

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THE ACQUISITION AND DEVELOPMENT OF THE WH QUESTION TRANSFORMATION IN CHILD LANGUAGE[1]

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THE ACQUISITION AND DEVELOPMENT OF THE WH QUESTION TRANSFORMATION IN CHILD LANGUAGE

Question formation is a crucial skill in cognitive development; linguists consider it to be a language universal. Studies of your children's language reveal their use of Wh questions, that is, those questions introduced by an interrogative from the set Who, What, When, Where, Why, and How, although the order of acquisition in relation to imitation, comprehension and production is not clear.

Earliest psycholinguistic studies were primarily linguists' descriptions of their own children's speech. In more recent years, spontaneous speech samples were tape recorded and later described (Brown, 1973; Miller and Ervin, 1964). The major weaknesses in a methodology using spontaneous speech samples as the basis of linguistic description is that only samples of the productive ability of the speaker are obtained. Chomsky (1964) suggested employing "devious means" to elicit evidence of linguistic competence. Using indirect methods several researchers devised materials and methods to elicit speech samples from children in a controlled stimulus situation (Berko, 1958; Fraser, Bellugi, and Brown, 1963; Menyuk, 1969; Smith, 1973). Fraser, et al. (1963) measured children's control of 10 grammatical structures by employing Imitation, Comprehension, and Production tasks, but the 10 contrasts did not include questions. Descriptions of questions in child language have been limited to spontaneous speech samples and have therefore ignored the Imitation and

Comprehension aspects of competence. In studies based on spontaneous speech, Brown (1968) and Klima and Bellugi (1973) described developmental sequences in the acquisition of question transformations.

The present study is based on elicited samples of children's speech as evidence of their Imitation, Comprehension, and Production of the Wh question transformation. The purpose of this study was to tap areas of child competence in the Wh question transformation that heretofore have not been studied. Selected linguistic variables, that is the type of Wh question and the phrase structure rules required for the verb phrase were examined to determine how they relate t the acquisition and development of the Wh question transformation. The data revealed that children uttered many deviant responses to the stimulus sentences on the Imitation and Production tasks, suggesting that children develop their own personal theories of grammar as they proceed toward an adult model. Therefore, these responses were classified by grammatical patterns and analyzed by Wh question type and verb phrase type.

Method

Participants

Participants for the study were 48 children ranging in age from 2.6 to 6.5 years. Three boys and three girls were randomly selected from each of eight age groups established at six month intervals. The two-, three-, and four-year old children were selected from a middle-class nursery school; the five- and six-year-old children were selected from two middle-class public school kindergartens and first grades. All children chosen for the study

were Caucasian, spoke English as their native language, and were free of any serious speech, hearing, and/or mental handicaps. Screening was done by eliminating non-Caucasian, non-native-English-speaking children, and speech, hearing, and/or mentally handicaped children on the basis of teacher evaluations.

Tasks

Three tasks, each containing 36 stimulus sentences were employed to measure competence in the Wh question transformation: Imitation, Comprehension, and Production. Linguistic and non-linguistic responses were elicited. The stimulus sentences were balanced and counter-balanced according to the type of Wh question and according to the phrase structure rules required for the verb phrase. They were also controlled for length and vocabulary.

For the Imitation task the child was directed to repeat each structure after it had been said by the investigator. In the Comprehension task two sets of stimulus pictures were used to elicit responses. One set of pictures was introduced at a time; the child was then asked to respond to Wh questions related to the set. The child could respond by pointing, acting out, or answering. For the Production task a controlled stimulus situation using a "cookie monster" hand puppet was devised to elicit the child's responses. The child was directed by the investigator to "Ask the cookie monster. . . ." The investigator had the puppet "answer" the child's questions in order to simulate discourse. If the child did not respond to a sentence in any of the tasks, the stimulus sentence was repeated once, and then the investigator went on to the next sentence. All the responses

were scored correct or incorrect according to the following criteria:

> Linguistic responses met the adult criterion for Standard American English.
>
> On the Imitation task the responses were exact repetitions of the stimulus sentences. Appropriate contractions were considered acceptable.
>
> If the child changed a response, the "corrected" response was the one scored.

A game-like context was used to make the task administration as natural as possible. Each child was given at least two practice items prior to each task. Some of the younger children required extensive practice in Imitation before doing the Imitation task. The game "Follow the Leader" was used to help the children understand the imitative response required of them.

Procedure

Tasks were administered to the children individually in a separate room although some of the younger children were permitted to have a parent or teacher present to make them feel comfortable. The observer, however, was not permitted to cue the child.

Reliability

Inter-rater reliability was established as a percentage of agreements between two sets of five transcriptions and scores from the three tasks based on the total number of utterances. Agreement levels were all above 90%.

Results and Discussion

Four research questions were posed:

1. What is the order of Imitation, Comprehension, and Production in the acquisition of the Wh question transformation?

2. What is the order of Imitation, Comprehension, and Production in the acquisition of the Wh question transformation for each type of Wh question (Who, What, When, Where, Why, and How)?

3. What is the order of Imitation, Comprehension, and Production in the acquisition of the Wh question transformation for each verb phrase type (present + be, present + be + ing, and present + do + verb)?

4. What are the patterns of acquisition revealed by deviant responses when children imitate or attempt to produce Wh questions? Are these deviant responses related to the Wh question type and/or the verb phrase type?

For the first three research questions means and standard deviations of scores were calculated for the Imitation, Comprehension, and Production tasks for each age group and for the total group on each task. Scores on the three tasks were analyzed using an age by task factorial analysis of variance for repeated measures on task. To determine the effects of task on performance for each age group, an analysis of variance for repeated measures design was carried out on the scores for each group. Differences among means for significant main effects were tested at the .05 level.

Where it was determined by an analysis of variance that there were differences among the tasks, the data were analyzed using *t* tests between pairs of tasks: Imitation vs. Comprehension; Comprehension vs. Production; and Imitation vs. Production. The level of significance for the paired-comparisons was set beyond the .002 level according to the Bonferroni Principle:

$$\text{alpha level} = \frac{\text{overall significance level}}{\text{number of statistical tests}} = \frac{.05}{24} = .002$$

To determine the patterns of grammatical development in the

acquisition of the Wh question transformation, the children's responses were analyzed according to the categorization techniques used by Brown and Bellugi (1964) and Menyuk (1969). Since both of these techniques proved to be inadequate in describing the grammatical patterns found in the deviant responses on the Imitation and Production tasks, appropriate categories for discussing the children's deviant responses in this study were developed.

Table 1 presents the results of the age by task factorial analysis of variance for repeated measures on task. The results

Table 1

Age by Task Analysis of Variance for Repeated Measures on Task

Source	SS	df	MS	F	Percent of Total SS
Age	6446.382	7	920.912	19.34****	53.21
Task	1288.292	2	644.146	31.57****	10.63
Age x Task	843.264	14	60.233	2.95***	6.96
Error Variance					
Unit	1905.056	40	47.626		
Task x Unit	1632.441	80	20.406		
Total	121115.383	143	84.723		

Note. N = 48

****p < .001

***p < .005

indicated that age ($p < .001$), task ($p < .001$), and the interaction of age and task ($p < .005$) each had a significant effect on per-

formance. Age accounted for 53.21% of the total variance and thus was a stronger determinant of performance than task which accounted for 10.63% of the total vaiance. Therefore, performance is more a function of age than task, although task is influential. The interaction of age and task which also was significant ($p < .005$) accounted for 6.96% of the variation in performance. A total of 70.80% of the variance could be explained by the variables under study.

Older children generally performed better than younger ones. The performance of the youngest children, ages 2.6 to 2.11, was distinct from that of the other children. Two patterns of performance were found: (a) for children ages 2.6-2.11, no significant difference between Imitation and Comprehension or between Imitation and Production, but Comprehension > Production and (b) for children ages 3.0-6.5, no significant difference between Imitation and Comprehension, but both Comprehension and Imitation > Production.

Performance on the three tasks for each Wh question type, Who, What, When, Where, Why and How, paralleled the performance on the total task with the older children generally performing better. Three patterns of acquisition were found for the six Wh question types: (a) For Who, What, Where, and How questions the pattern was: no significant difference between Imitation and Comprehension, Comprehension > Production, and Imitation > Production; (b) For When questions: no significant difference between Imitation and Comprehension or between Comprehension and Production, and Imitation > Production; and (c) For Why questions: Imitation > Comprehension; no significant difference between

Comprehension and Production; and Imitation > Production. The different patterns appear to be related to the degree to which the referents were removed from the symbols. Methodological problems involving the difficulties of creating picturable correlates for When and Why questions also seemed to affect the children's performance. Overall, here again, Production lagged behind Imitation and Comprehension for each Wh question.

Although significantly different only for Who, What, Where, and How questions, the pattern of performance, Comprehension > Production was strongly indicated throughout the six Wh question types. This may accurately reflect a developmental pattern, but it also may highlight the difficulty of devising ways to elicit production of the full range of linguistic forms.

One possible explanation why Comprehension was higher than Production could well be the nature of the Comprehension task itself. Although pictures were used for all questions on the Comprehension task, not all questions could be answered by pointing to or naming specific referents. For example, for all of the Who, What, Where, and for most of the How questions specific referents were available (e.g., "Who is chasing the dog?"; "What does the girl have in her hand?"). However, for the When and Why questions referents could not as easily be supplied (e.g., "When does the girl catch the dog?"). Some of the children were able to answer When questions by pointing to a sun or a moon, but for many, that symbolic connection was not always made.

Although all of the Wh questions required the children to make symbolic connections, the complexity of that connection

varied with the Wh word. The symbols When and Why were further removed from the objects than were Who, What, Where, and How. The Why questions were even more problematical, requiring the child to make inferences based on observations (e.g., "Why is the dog running?"). It would appear, therefore, that Comprehension of Who, What, Where, and How questions was significantly better than Production of these questions because concrete referents were more readily available for these four types.

In comparing the difficulty of answering various Wh words, Ervin-Tripp (1977) found that children as young as 36 months gave categorically appropriate replies to Why questions, but that instrumental answers to How and temporal answers to When questions were significantly more difficult for young children. Although post hoc comparisons between the means for the six Wh types were not made, the total group means on Comprehension were: How = 5.104; Why = 4.854; and When = 4.792. It would appear that Why questions might not be as easy to comprehend as Ervin-Tripp suggested. Methodological problems presented by these questions further complicate drawing firm conclusions. The How questions for the Comprehension task in this study were purposely designed to have as many concrete referents available in the pictures as possible. The task itself, therefore, may have reduced the degree of difficulty between Why and How questions. Further analysis, semantically controlling the stimuli, might support other inferences about the degree of difficulty of the Wh question types. It appears, however, that concrete referential support aids young children in responding to and possibly acquiring control of questions.

In a study of preschool children's comprehension of passive sentences Hutson (1973) found that semantic support was a significant factor and concluded that sentences supported by semantic features identifiable by young children might be acquired earlier than those sentences without such support. Similarly, semantic support may be a significant factor in the acquisition of the Wh question transformation.

The means for the various age groups for Imitation and Production revealed a similar pattern. Imitation was higher than Production or not different from Production for all age groups for Who, What, Where, and How questions. Production was higher than Imitation for children ages 3.6-3.11 on When and Why questions. The order, Imitation > Comprehension was seen only for Why questions. This clear distinction might be explained by the fact that young children ask Why questions repeatedly searching for answers to difficult problems long before they can fully assimilate the explanations. Following this reasoning, the order Production > Imitation for Why questions might be expected. However, the data were consistent in revealing the order Imitation > Production even for Why questions. It is possible, then, that for the early language acquisition, Imitation plays an important role, but becomes less influential in later development.

The general trend found for the first two research questions was also seen for the third question: Production was lower than both Imitation and Comprehension, but the order of Imitation and Comprehension was not clearly established. Older children generally performed better than younger children on the three verb phrase

types on all three tasks. Two patterns of acquisition were described, the first for Wh questions containing the verb phrase present + be or present + be + ing, and the second for those containing present + do + verb: (a) no significant difference between Imitation and Comprehension; Comprehension > Production; and Imitation > Production and (b) no significant difference between any of the tasks. The verb phrase type appeared to be related to the acquisition of Wh questions in young children. The findings also suggest that although Wh questions containing the verb phrase present + do + verb were grammatically more complex than those containing the other two verb phrase types, the children did not have less facility with Wh questions containing present + do + verb and, in fact, may perform better with this type than with the other two.

If children as young as 3.0-3.5 and 3.6-3.11 can achieve means of 8.333 and 10.500 representing 69% and 88% respectively on the Production tasks for Wh questions containing the verb phrase present + do + verb, then it appears that even very young children are more competent than has been previously recognized. As Bellugi (1965), Brown (1968), and Menyuk (1969) suggest, there do appear to be intermediate stages through which children proceed in which they test out theories of grammar. However, the findings for the three verb phrase types suggest that Bellugi's (1968) hypothesis that there may be a performance limitation on the number of operations used in one sentence may not explain early stages of syntactic development. It is also possible that defining syntactic difficulty for young children may not be done in terms

of the number of operations needed to perform a transformation but rather in the kinds of operations required.

Deviant responses for the Imitation and Production tasks were categorized according to their particular grammatical characteristics. Type I responses are sentences in which the children applied intonation for questions to otherwise unchanged declarative sentences (e.g., The birds are flying?).

Type II responses are those in which the children preposed the Wh question word and omitted the auxiliary, the modal, or the form of 'be' as a main verb (e.g., How they work?).

In Type III responses the children preposed the Wh question word but left the remaining declarative sentence containing the auxiliary 'be' or the modal 'do' intact (e.g., Why they do jump?).

Type IV responses include preposing the Wh question word and inverting the auxiliary of modal and the subject, but without number agreement between the subject and the auxiliary/modal (e.g., Where is the toys?).

Type V responses are those classified by Menyuk (1969) as "Aux-Modal plus Aux-Modal/Verb" (e.g., Where's your mother is going?).

Type VI deviant responses were also described by Menyuk (1969): "Tense Marker on Both Aux-Modal and Main Verb" (e.g., Where's Maria lives?).

Responses classified as Type VII are those which are grammatically standard but are not exact responses to the stimulus sentences. For example, one child substituted 'How come' for 'Why.'

Type VIII responses are those in which the children gave partial repetitions (e.g., 'where he lives'), or answers (e.g., 'He lives on Sesame Street'), for the stimulus sentences for the Imitation and Production tasks.

Although all types except Types V and VI were found for Imitation, most of the deviant responses were Type IV responses. Therefore, on Imitation, most of the children were performing the operations of preposing and transposing, but as indicated by the Type IV responses, some of them did not apply the number agreement rule.

The Production task elicited 415 deviant responses, substantially more than the 63 on the Imitation task. In addition to all the types of deviant responses found for Imitation, two additional types were found for Production (Types V and VI). The highest number of deviant responses for the Production task was Type II in which the children preposed the Wh question word and omitted the auxiliary, the modal, or the form of 'be' as a main verb. The second highest was Type VIII which were grammatically standard sentences, but were not exact responses to the stimulus sentences. Overall, even the deviant responses indicated that most of the children performed most of the operations of the Wh question transformation.

Deviant responses were found for all Wh question types on the Imitation and Production tasks. On Imitation the highest number of deviant responses was elicited by How questions, then Who, When, and What, Where, and Why questions, whereas on Production the highest number was elicited by Who questions, then Where,

What, How, When, and Why questions. The pattern for Production suggests that children may produce more deviant responses for Wh questions that have immediate concrete referents. Although the pattern for Who and Why questions on Imitation was similar to that for the same Wh question types on Production, the other Wh question types followed another trend. However, since the total number of deviant responses for Imitation was limited and substantially lower than the number for Production, the findings are inconclusive.

All three verb phrase types elicited deviant responses on the Imitation and Production tasks. The highest number of deviant responses on Imitation was elicited by Wh questions containing present + be + ing, then present + do + verb, and present + be. For Production, Wh questions containing the verb phrase present + be elicited the highest number of deviant responses, then those containing present + be + ing, and present + do + verb. The pattern of performance suggests that the less complex the verb phrase, the more likely children are to produce deviant responses.

The substantially larger number of deviant responses for Production (415) than for Imitation (63) suggests that children imitate Wh questions before they search for the semantic understanding needed to produce them. The varied forms uttered by the children on the Production task also suggest that the children are actively involved in searching for meaning by abstracting and applying grammatical rules of their own as they move toward the adult criterion.

The deviant responses suggest that the children are developing

their own personal theories of grammar. Children seem to test out these theories in deviant responses. Therefore, the deviant responses are not simply random errors nor are they based solely on linguistic input. Instead, they are indicators of the search for meaning.

The analysis of deviant responses reveals that the children's performance is related to task, Wh question type, and verb phrase type.

Implications

A review of the current literature indicates that there are many aspects of child grammar which have not been fully described by developmental psycholinguists whose ultimate goal is to describe the linguistic competence of the child. One such area is the acquisition and development of Wh questions. By improving on the methodology by gathering information on elicited samples of the child's ability to imitate, produce, and comprehend Wh questions controlled for Wh type and verb phrase type, this study described the children's patterns of performance. In further examining the deviant responses children gave on the Imitation and Production tasks, this investigation described many intermediate stages through which children proceed before they imitate and produce Wh questions that meet the adult criterion. Since the methodology developed for this research was successful in eliciting responses from young children, it implies that the Imitation, Comprehension, and Production tasks as they were refined for this study can be used to gather extensive information about the three aspects of competence, Imitation, Comprehension, and

Production, for specific, linguistically controlled structures. However, although most of the children responded by pointing to the pictures or answering the questions for most of the stimuli for the Comprehension task, some of them did not respond at all. It appears, therefore, that the Comprehension task was somewhat limited in eliciting responses from the children. A lack of response could not necessarily be interpreted as a lack of Comprehension. This suggests that although "devious means" employed as elicitation techniques are generally successful, other methods need to be developed to tap underlying competence.

The findings also suggest that the Production task in particular lends itself to eliciting deviant responses from children, and that in examining these deviant responses researchers may gather further information about children's linguistic competence. All of the deviant forms described by other researchers were found for the elicited responses for Imitation and Production in this study; in addition, other types of deviant responses were also found. Whereas previous studies described only a few children's spontaneous speech samples, this study presented data for 48 children grouped at six-month intervals from ages 2.6 to 6.5. Therefore, the methodology employed here suggests that Imitation and Production tasks as refined for this research can improve our understanding of children's language by providing stimuli to elicit many possible deviant responses from young children.

It appears, then, that in order to gather as much information as possible about how children acquire language, researchers need to use both spontaneous samples and structured tasks to elicit

responses. Quantitative and qualitative analyses are both necessary, that is, researchers need to examine the children's responses as measured against the adult criterion as well as what children do when they produce responses that do not measure up to that criterion.

The methodological difficulties that arose in this study suggest that children recognize that language is functional. For example, rather than imitating or producing questions on the Imitation or Production tasks, some children answered the stimuli; other children did not focus on the tasks but tried to engage in a discussion about the room, the pictures, and other subjects related to their immediate needs. Although a few children were unable to suspend their disbelief and did not interact with the "cookie monster" puppet for the Production task, most of them did. The children's behavior implies that a methodology that simulates a realistic discourse situation as did the use of the "cookie monster" hand puppet or that sets up a real language exchange between the child and the experimenter will elicit responses that might yield more information about the child's competence than those which the child perceives as contrived. Therefore, the social context in which the language samples are gathered must be carefully considered.

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